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Performance of chemical herders for in-situ burning of crude oil in ice infested waters

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In Situ Burning is an oil spill response technique with a good potential for remote and ice infested waters. Fire resistant containment booms are commonly used to collect and keep the oil slicks thick in open water. However, the presence of ice can make the fire booms' application more challenging. The herders are chemical surfactants that spread out to form a monolayer on the water surface resulting in compaction and thickening of the oil slick. Therefore, these herding agents could be a good alternative for accidents in ice infested waters. The effectiveness of the herder was studied with respect to the ignition and burning of oil slicks. Specifically, the average slick thickness, the distribution of slicklets on the water surface and the burning efficiency were studied as a function of different ice coverages (0%, 20%, 50%, and 80%). Experiments were performed in an intermediate scale water basin (16 m^2) outdoors in Sisimiut, Greenland and in a small scale, indoor laboratory setup (1 m^2) at DTU. A predetermined amount of crude oil (approximately 240 mL) was allowed to spread for 30 minutes and afterwards the herding agent was applied (150 µL/m^2 oil) in the vicinity of the edges of the water surface, and then allowed to herd the oil for 30 minutes. The average slick thickness of the herded oil reached up to approximately 5.5 mm and the oil slicks could easily be ignited. The chemical herders were proven to be efficient herding and thickening the oil up to the required ignition limit, however, the formation of multiple, individual oil slicks on the water surface because of the ice presence, made more complicated the ignition process and reduced the burning efficiency by 15-25%. The obtained results merit further research beyond the scope of the current investigation.